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G.C. Churchill
Dec 21/92

THE
SEARCH FOR FRANKLIN.

A SUGGESTION
SUBMITTED TO THE BRITISH PUBLIC,

BY
AUGUSTUS PETERMANN, F.R.G.S.,
HONORARY AND CORRESPONDING MEMBER OF THE GEOGRAPHICAL SOCIETIES OF
BERLIN AND FRANKFORT.

ILLUSTRATED BY A POLAR CHART.

“Will the English nation continue to send Expedition
after Expedition in search of Sir John Franklin, through
the most difficult and dangerous seas, and leave the most
practicable line of search untried?”

LONDON:
LONGMAN, BROWN, GREEN, AND LONGMANS.

1852.

Price Two Shillings.

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A SUMMARY OF FACTS

WORTHY OF NOTICE.

Highest latitudes reached by the various Searching Expeditions, with the finest steam and sailing vessels, in Wellington Channel (Penny)	76° 26' N.
Ditto to the north of Behring's Straits (Collinson)	73° 14' N.
Sir Edward Parry (1827), in the sea of Petermann's proposed line of search, <i>in boats</i> , against a powerful current, reached	82° 40' N.

Probable cost of the various Government and private Searching Ex- peditions, the only result of which, hitherto, has been to find the traces of a point which Franklin <i>passed six (!) years ago</i>	£500,000
Cost of Sir E. Parry's aforesaid Expedition	£9,977

"A ship might have sailed to the latitude of 82° almost without touching a piece
of ice."—Parry's *Narrative*, p. 148.

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PREFACE.

THE subject of the following pages was first conceived by me about the beginning of the present year, at the time when Captain Beatson started a scheme for proceeding in search of Sir John Franklin to the north-west of Behring's Straits, through the open water seen by Wrangell. Deeming my proposed route to the same open water of Wrangell preferable in more than one respect to that of Captain Beatson, and, in certain points, likewise preferable to all other routes, I lost no time in making my plan publicly known. I am not aware that any steps have hitherto been taken, which would be likely to result in its realization. But now that Captain Beatson's scheme remains for the present unexecuted, and the great Government Expedition has been again despatched to those difficult seas, in which the united efforts of numerous explorers have hitherto resulted in advancing only to that point which Franklin passed six(!) years ago, I am induced to republish my papers in a collected form, in the hope that they may receive that attention which the importance of the subject seems to demand.

Most of these papers were recently published by Captain Mangles, R.N., in his work "Arctic Searching Expeditions, 1850-51-52", and he has kindly allowed me the use of the type and the accompanying chart on the present occasion.

Before concluding, I think it incumbent on me to repeat that my plan is not to send out an expedition *during winter*, but towards the end of that season and *during the spring*; and that my views are far from being based merely on "Isothermal lines" and Physical hypotheses. The important results of one of my authorities alone, namely Sir Edward Parry (see the opposite page), are in themselves a sufficient basis for my views generally; and I simply solicit the candid perusal of the *facts* adduced by me, from which every one will be in a position to draw his own conclusions.

AUGUSTUS PETERMANN.

15th May, 1852.

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I. MR. AUGUSTUS PETERMANN'S PLAN OF SEARCH.

(From the Parliamentary Papers.)

To Admiral Sir Francis Beaufort, K.C.B.

"5, Camden Street North, 23rd January, 1852.

"SIR,—I have the honour to make to you the following communication relative to the search after Sir John Franklin, which I am anxious humbly to submit to the special notice of the Lords Commissioners of the Admiralty.

"The subject of Sir John Franklin's expedition has so long filled the minds of the most eminent men, and excited the interest of the whole world, that I fear I am laying myself open to the imputation of great presumption in venturing suggestions respecting this subject. Nevertheless I have considered it my duty not to withhold the results of a comprehensive and earnest, yet calm, inquiry; and having been impressed with the necessity that no time should be lost in making those results as extensively known as possible, I inserted in the *Athenæum* of last Saturday (the 17th instant) the remarks of which the following is a copy.

"It is the general opinion that Franklin has passed through *Wellington Channel*. If so, it is beyond doubt that he must have penetrated to a considerable distance further, so as to have rendered it exceedingly difficult, if not impossible, to retrace his steps, should he have found it impracticable to proceed in any other direction. It may be idle to speculate on his probable direction and distance from *Wellington Strait*, but a line drawn from *Melville Island* to the *Herald* and *Plover Islands* (north of *Behring's Straits*), and another from *Melville Island* to *Spitzbergen* on the American side, would, with the *Siberian* coasts and islands on the Asiatic side, include the space in which he must have been arrested, a space of fearful extent, when it is considered that the whole of the regions hitherto explored by the various expeditions sent in search of him are scarcely one-third of those which remain unexplored.

"It is a well-known fact that there exists to the north of the *Siberian* coast, and, at a comparatively short distance from it, a sea open at all seasons; it is beyond doubt that a similar open sea exists on the American side to the north of *Parry* group; it is very probable that these two open seas form a large navigable Arctic ocean.

"It is evident that until an entrance into this Arctic basin has been effected, that is to say, into that part of it which is comparatively open and navigable, scarcely any hope can be entertained of rescuing Franklin, or of ascertaining his fate. The determination to send another expedition to *Wellington Channel* is noble and generous, but it is perhaps questionable whether the present season will prove as favourable as the last, and whether, indeed, the expedition will succeed in passing through *Wellington Channel* to the north. In short, *Wellington* and *Behring's Straits*, the two chief entrances from the American side into the Polar basin, have, owing to the proximity of the land and accumulation of ice, hitherto frustrated the most determined advances of the various expeditions in those directions.

"There are only two other sea entrances into the Polar basin. These are between *Greenland* and *Spitzbergen*, and between *Spitzbergen* and *Novaia Zemlia*. With respect to the former, I shall refrain from comment, as the difficulties connected with it are very great. I therefore confine myself to the latter; and, coming at once to the point, I would suggest, that the wide opening between *Spitzbergen* and *Novaia Zemlia* most probably offers the easiest and most advantageous entrance into the open navigable Polar sea, and perhaps the best route for the search after Sir John Franklin.

"From those navigators who have attempted, during the summer months,

to penetrate northward in that direction—Barentz as early as 1594—we learn that a barrier of ice was found to stretch across the sea between these two groups of islands. And such undoubtedly is the case every year with each recurring summer. It is that immense body of Arctic ice which every spring is known to drift with a powerful current from the *Siberian* coast towards the Atlantic Ocean. In the 80th parallel, and beyond it to the south, it meets with the shores of *Greenland*, *Spitzbergen*, and *Novaia Zemlia*. Between the two latter it encounters the Gulf Stream, which prevents its drifting further south in that direction, and thus renders the shores of northern Europe entirely free from that unwelcome visitor, whereas the American countries in the same latitudes are more or less encased in ice throughout the whole year. On the other hand, between *Greenland* and *Spitzbergen*, the icebearing current steadily pursues its way, passing *Iceland* and the southern extremity of *Greenland*, and reaching the shores of *Newfoundland* and as far as 40° north latitude; so that while its course is arrested between the northern part of *Novaia Zemlia* and *Spitzbergen*,—no floating ice having ever been known to reach *North Cape*,—on the other side of the Atlantic it travels upwards of 2,500 miles further south.

“The barrier of ice which may justly be supposed to exist between *Spitzbergen* and *Novaia Zemlia* during every summer, unquestionably presents obstacles to vessels penetrating northward, but there is no reason to consider these obstacles greater than those on the opposite American side in *Davis's Straits*, *Baffin's Bay*, *Lancaster Sound*, and *Barrow Straits*; and we have, moreover, the testimony of numerous whalers and other navigators in the *Greenland Sea*, that whenever they succeeded in pushing through this barrier of ice, they found to the north of it a sea more or less open and free from ice. A vessel, then, which, by watching for an opportunity, should effect a passage through this ice, would, no doubt, find itself in the great open navigable ‘*Polinya*’ of the Russians.

“The preceding remarks are offered to the attention of the reader, not as anything new, but as well established facts, which are submitted, by way of preparation, for the consideration of that portion of my views which I believe to be entirely new, and which, without further preface, I now humbly submit to public notice. My belief is, nay, I think I am able to demonstrate, that during the Arctic winter months, namely, from September to March, an entrance into the North Polar Sea through the opening under consideration, may be much more easily effected than during the summer months; and also, that the further navigation of the *Siberian Sea* may likewise be performed with much greater facility in winter than in summer.

“And here the principles which regulate the distribution of the gaseous and fluid coverings of the earth must, in the first instance, be brought to bear upon the subject. It admits of little doubt that some, at least, of the currents of the Arctic Ocean, are revolving currents, the direction of which is during the summer months from the pole to the south, and, in the winter months, the reverse. Our actual observations of this phenomenon are, unfortunately, very limited; but we know just enough to confirm the argument as far as it relates to the *Siberian Sea*. According to *Wrangell* and others, the current there during the summer runs from east to west; but in autumn, when the cold sets in, it changes, and proceeds from west to east. Now, if we take the compasses, and place one point of them on a polar chart, between *Lancaster Sound* and *Fury and Hecla Strait* (as a centre), and the other point on the *Faroe Islands*, and with the latter describe a circle to the northward, this circle will touch *North Cape*, the northern shores of *Novaia Zemlia*, *Cape Taimura* (the extreme northern point of Asia), the northern coasts of *New Siberia*, and *Behring's Straits*. And as we know that along the first portion of this line, from the *Faroe Islands* to *Novaia Zemlia*, and also along the last portion of it from *New Siberia* to *Behring's Straits*, the current in the winter time flows in the direction from the *Faroe* to *Behring's*

Straits, it is hardly possible that a counter current should exist in the intervening portion between *Novaya Zemlia* and *New Siberia*. Besides, the prime movers of the great Arctic current, which flows during summer from the Siberian coasts towards the Atlantic, namely, the Siberian rivers, are frozen during the winter, and have, consequently, no influence on the currents of the Siberian Sea. Hence there is every reason for concluding that this great Arctic current, bringing the drift ice from the Siberian shores, relaxes in its force by the end of summer, so that the gulf stream, which during spring and summer was checked and hemmed in by the ice between *Novaya Zemlia* and *Spitzbergen*, makes at last its way towards the Siberian coast, carrying with it whatever drift ice may have remained in that region, and actually clearing the way for an easy navigation.

"In corroboration of this result, an important physical fact relative to the distribution of temperature may be adduced. Taking the invaluable data of Professor Dove as a basis, I have laid down on twelve Polar charts the lines of equal temperature of every month in the year; and from a careful study of these lines, I have deduced the following remarkable conclusion:—There exists a moveable pole of cold, which in January is found on a line drawn from *Melville Island* to the mouth of the *River Lena*, and which gradually advances towards the Atlantic Ocean, till in July it is found on a line between *Fury and Hecla Strait* and *Novaya Zemlia*, whence, in the succeeding months of the year, it gradually recedes to its former position. It is clearly manifest that this movement of the temperature is occasioned by the direction of the currents and the presence of the Polar ice. The greatest mass of this ice is (it is scarcely necessary to say) formed where the winter cold is the greatest, namely, in the region of *New Siberia*, on the Asiatic side, and in that of Parry group on the American side; and when broken up and driven away into the Atlantic, masses of ice (as is well known) in their progress reduce the temperature wherever they go. Hence, in January and February, *Melville Island* and *Boothia Felix* are the coldest stations on record on the American side, being as much as 10° to 15° colder than *Igloodik* and *Winter Island*; whereas, in July, they are from 5° to 7° warmer than those places, owing to the ice having floated down in the direction of the latter. On the Asiatic side, the difference is still more striking. In January, the mean temperature along the north-eastern shores of *Siberia*, is from 40° to 50° lower than that of the western shores of *Novaya Zemlia*; while in July, it is as much as 20° higher. It must be borne in mind that Wrangell and Anjou, in their memorable expeditions, selected the most favourable of the winter months for their journeys over the ice, at a season when they hoped to find the ice most solid and of the greatest thickness. Nevertheless, they invariably found the 'wide immeasurable ocean' before them, at a comparatively short distance from the land; and this, too, to the north of what is actually the coldest region on the face of the earth. Now, it would be a monstrous anomaly, if at some distance to the west, where a warm current is known to prevail, and where the temperature is from 40° to 50° higher, we should not find the same 'wide immeasurable ocean.'

"I could adduce a number of facts from the evidence of the Russian surveyors and others strongly corroborative of these views, but refrain from doing so in deference to your space. But I think it important to refer briefly to what the well-known Norwegian naturalist Keilhau has informed us of with respect to the climate of *Bear* (called also *Cherry*) *Island*. This island is situated between *North Cape* and *Spitzbergen*, in the same latitude as *Melville Island*, and is exposed to the entire influence of the surrounding ocean. Keilhau tells us that in the year 1824, during the whole of the autumn and winter, the weather was mild, and at Christmas there was rain (this in the latitude of *Melville Island*, where the mercury is frozen during five successive months). February was cold and clear, but the cold never too great for out-door work. On the 10th of that month, the sun was seen

again for the first time, its disc just rising above the sea. In March the cold increased, especially with north-east wind. April was the coldest month of all, with northerly and north-easterly wind, the sea steaming and freezing all round the island. In the middle of that month, the cold was so severe, and the vapours from the sea so overpowering, that it was with the greatest difficulty they could venture into the open air. In May, irregular winds. In June, the prevalent wind was north-east, which brought with it a quantity of drift ice. On the 1st of July a great deal of drift ice came with the north-east wind, but the weather was clear and mild. Thus, we see that during the Arctic winter, when the sun was entirely below the horizon, the weather was exceedingly mild. From November till February not one instance is adduced of the winds coming from the north-east, but often from the south and south-west, with rain at Christmas. This warm wind would, of course, extend farther, precisely in the direction towards the *Siberian Sea*. But after the appearance of the sun, when the temperature of the whole Polar region would be raised, when the ice would begin to break loose, expand, and disperse to southerly latitudes, then it was that the north-east wind prevailed; and as this wind came from and brought with it the approaching ice masses, it would naturally lower the temperature gradually from February till April, when it attained the minimum. In June and July the drift ice itself had reached the island; but as the north-east wind now blew from the open sea behind the drift ice, it became mild. Nothing can be more strikingly illustrative of the moving pole of cold.

"Lastly, I will adduce the direct and unimpeachable evidence of one who actually saw an open sea in winter to the north of *Novaia Zemlia*, namely, Willem Barentz. This able, bold, and honest seaman is the only one with his party who ever spent a winter on the northern shores of that island. Even on his first voyage, when he succeeded during the summer in tracing the coast of *Novaia Zemlia* as far north as *Icy Cape* (in 77 degrees of latitude according to his reckoning), where he was stopped by the ice, he came to this important conclusion, 'We have assuredly found that the only and most hindrance to our voyage was the ice that we found about *Nova Zembla*, under 73 to 76 degrees; and not so much upon the sea between both the landes (viz., *Spitzbergen* and *Novaia Zemlia*), whereby it appeareth that not the nearness of the *North Pole* but the ice that commeth in and out from the Tartarian Sea about *Nova Zembla* caused us to feel the greatest cold. As soon as we made from the land, and put more into the sea, although it was much further northward, presently we felt more warmth.' On the third and last of his remarkable voyages, Barentz made the land of *Novaia Zemlia* on the 7th of July 1596, and reached its north-east extremity on the 16th of August. They were, however, shortly afterwards beset by ice, and obliged to winter on the north coast of the island. While employed in erecting their hut, on the 26th of September, the wind came from the west, which drove the loose ice that was afloat away from the land, and left the sea open near the coast; of this, unfortunately, they could not take advantage, as the ship was considerably injured, and was besides imbedded in a closely-packed body of ice, so that she lay as if upon a firm and solid rock. On the whole, they suffered much less from the cold of the winter than they had anticipated, and so much snow fell during the winter that the Hollanders had almost every day to clear the entrance to their hut; a proof that open water could not have been far distant. On the 8th of March, after the appearance of the sun, the great open sea to the north began to be distinctly visible to Barentz and his party.* In May they had got their two boats afloat, returning along the coasts to the south. At the commencement of this voyage in the open boats, Barentz, who had been declining in health, expired, believing, and with his last breath affirming, that, had he stood more between the two lands, he would have been able to enter the open sea.

* For particulars, see Appendix p. 19.

"I cannot but think, then, that on the consideration of all the circumstances, it will be the opinion of those who are most competent to decide on the question, that an entrance into the Polar Basin through the opening under consideration, as well as the navigation of that 'wide immeasurable ocean', might be more easily effected during the Arctic winter than in the summer months. At all events, I respectfully beg to submit the point, together with the whole subject, to their serious consideration.

"It would ill become me to offer any suggestions as to the mode in which an expedition, if decided on, should be carried out; but I may, perhaps, be allowed to remark, that as regards the time of its departure, the remaining months of the present Arctic winter would seem preferable to the first months of the next, and this for two reasons:—First, a period from six to eight months would be gained, which under the urgent circumstances of the missing expedition may be of vital importance; secondly, vessels arriving in the Polar Sea in February or March, just before or when the sun has made its appearance, might, if only once able to enter the Polar Basin, easily traverse it to the opposite side before the power of the sun had set in motion the great ice-bearing current, and they would then have before them the whole summer in the fullest sunshine for carrying out the object of their voyage, namely, the search for Sir John Franklin.

"But even if a vessel could not be despatched till later in the year, the chances of an entrance through the opening under consideration may, after all, turn out to be greater than through any other opening, inasmuch as the former is the widest of all, as much as nine times wider than *Behring's Straits*. And as to the great masses of drift ice, we know that they do not present insurmountable obstacles in an extensive sea. The late Sir John Barrow said, 'Where ice can float, a vessel can float also.'

"Before concluding, I will merely give the distances, roughly stated, to the various points:—From *Woolwich* to the 80th parallel, midway between *Spitzbergen* and *Novaia Zemlia*, is as far as from *Woolwich* to *Cape Farewell*, the southern extremity of *Greenland*, or about 2,000 geographical miles. From the said midway point between *Spitzbergen* and *Novaia Zemlia* to the *Herald* and *Plover Islands*, north of *Behring's Straits*, is as far as from *Cape Farewell* to *Beechey Island*, at the entrance of *Wellington Channel*, or about 1,600 miles. The two distances together, namely, from *Woolwich* to the 80th parallel, and thence to the *Herald* and *Plover Islands*, are not more than that from *Woolwich* to *New York, U. S.*

"A screw-steamer, at the rate of five miles an hour, would, under ordinary circumstances, reach the 80th parallel between *Spitzbergen* and *Novaia Zemlia* in seventeen days.

"I have been under the necessity of confining my suggestions to the merest outlines, as a further development would have extended my letter to an unreasonable length. But I shall be most happy to submit the whole of my data and charts to any one who may desire further explanation and detail."

"To the foregoing communication I beg now to add one observation as to the existence and nature of the barrier of ice said to stretch across the sea between *Spitzbergen* and *Novaia Zemlia* during summer. When I had recently the honour of a personal interview with you, you asked me what were my authorities on that subject. I now beg to state that it is my conviction that there is no really good authority decisive of the point; that in fact the passage between *Spitzbergen* and *Novaia Zemlia* has never yet been fairly attempted; and that, as is humbly suggested in my printed letter, the said opening into the Polar Basin may after all turn out to be the most favourable one even during the Arctic summer months.

"I beg to submit also two charts illustrative of my views, which I hope may facilitate the consideration of my letter.

"I have, etc.,

"Augustus Petermann."

II. Note on the above, by the Editor of the "Athenæum."

(January 17, 1852.)

This plan has, we believe, been submitted to Capt. Beatson,—who naturally is reluctant to give up his own plan, fostered by two years' consideration. If, however, the competent authorities, to whose opinions Mr. Petermann has made an appeal, should consider the Nova Zembla route a more advantageous one than that by Behring's Straits, he has, we are informed, expressed his willingness to adopt the former ;—but at the same time he has suggested that nevertheless he should be allowed to follow his own route if *another* vessel could be despatched by the Nova Zembla opening,—lest no one else should be found to follow up his proposed route. The important facts brought forward by Mr. Petermann should certainly be at once investigated. If they can be contradicted, if his conclusions can be proved to be incorrect—why, there is an end of the matter. If not, his plan deserves, as we have said, the most serious consideration ; for in that case his proposed route would seem to be the most feasible and advantageous of all,—a route, as we may say, at our very doors, the Gulf stream flowing past our shores—a route which Nature herself seems to point out to us.

We have seen Mr. Petermann's charts, which give a clear view of the physical aspects of the whole Polar regions, and of his views and proposed routes.

But even if Mr. Petermann's views should be confirmed, the Wellington Channel and Behring's Straits Expeditions should by no means be abandoned. It is in addition to these that another through the Nova Zembla ought to be despatched.—Who knows but that Franklin, having reached a high northerly latitude, has been arrested by a neck of land or islands abreast of Behring's Straits or the Flats of Siberia,—where even now he may be in view of the great open "Polinya" of the Russians, without being able to enter it with his vessels :—he may even be looking forward to a vessel coming to his succour from the side proposed by Mr. Petermann.

III. ADDITIONAL FACTS.

Communicated in a Letter to Captain Mangles, R.N.

(22nd March 1852.)

SIR,—In accordance with your request, I beg to submit to you some additional facts bearing on my paper on the Passage into the Arctic Basin between *Spitzbergen* and *Novaia Zemlia*, as offering probably the best route for the search after Sir John Franklin.

Since the publication of my paper, I have had the opportunity of perusing the full accounts of Admiral Lütke's voyages to the Arctic Ocean in the four consecutive years from 1821 to 1824, for the purpose of surveying the coasts of *Novaia Zemlia*. Of all voyages which have been undertaken in the direction of my proposed route, these form as yet the most authentic and important account of that part of the Arctic Ocean, but at the same time, it will readily be seen that they are, like the other attempts, insufficient to set at rest the question as to *how far the drift ice between Spitzbergen and Novaia Zemlia offers obstructions to vessels*. The object, indeed, of Lütke's voyages, was the survey of the coasts of *Novaia Zemlia*. In the first year he traced its western coast as far as $74^{\circ} 45'$ n. lat., when he found its most northern parts quite free from ice; and on the 25th August, 1821, when he commenced to shape his course southward and return, he did not see any ice

whatever to the north as far as his eye could reach. In the following year (1822), on the 11th August, he reached *Cape Nassau*, in lat. $76^{\circ} 35'$ north. At this prominent cape, where the coast rounds to the east, little ice was found at first, but it soon accumulated in such a manner as to render further progress difficult and hazardous. In the following year (1823) they reached the same cape on the 1st of August, and found the drift ice in nearly the same position. To vessels keeping close along the coast, this cape would certainly offer considerable obstacles in rounding it; here the elements, particularly the currents, are in perpetual conflict; a strong current from the south was observed by Lütke to be encountered by an easterly current, which brought the ice from the *Siberian* coasts, thence taking a direction towards *Spitzbergen*.

In his first three voyages, Lütke met with very little ice in the high sea as far as *Cape Nassau*; in his fourth and last, in which one of his instructions was to try what latitude he could attain in the open sea, he, unfortunately, encountered the ice in $75\frac{1}{2}^{\circ}$ north latitude. In this latitude he shaped his course to the west, keeping along the edge of the drift ice. When he had attained a westing of $43^{\circ} 49'$ east longitude in $76^{\circ} 5'$ north latitude, and still found the drift ice extending to the west, he abandoned his attempt and returned to *Archangel*.

It must be remembered, in the first place, that he devoted *only three days* to the whole attempt, namely, in sailing from the coast westward along the ice. A voyage of so short a duration, and in the most unfavourable of four consecutive seasons, with a vessel unsuitable for navigation among drift ice, is quite insufficient to decide the question. More unfavourable, however, than all this, must be regarded the time of the year in which Lütke made his voyages, namely, in the height of summer; his instructions being not to arrive at the coasts of *Novia Zemlia* till late in July, when the land ice would have been driven away from the coasts, allowing the approach of his vessel near enough for surveying purposes.

Now this time, namely the whole of our summer months, June, July, August, is precisely the time, as I have elsewhere endeavoured to show, when those seas are most encumbered with the floating ice which in the preceding months breaks loose from the *Siberian* coasts, and is driven away in that direction. These months, therefore, are the most unfavourable, whereas those of *March, April, and May*, are the most favourable for vessels proceeding in that direction; and there is no reasonable ground to doubt that a vessel in those months will easily effect an entrance into the Arctic basin, pass *Novia Zemlia*, *Cape Taimura*, and reach the *New Siberian Islands*, or the opposite side of the great '*Polynia*' of the Russians.

Professor Erman, the well-known explorer of *Siberia*, has published some remarks on Lieutenant Pim's projected expedition, which were brought home by that gentleman and presented to the Royal Geographical Society. In this pamphlet, Professor Erman quotes some exceedingly important facts and opinions of the late Hedenström, than whom no one probably has ever attained a more extensive knowledge of *Siberia*, and who published a work (in Russian) containing the results of his twenty years' residence and travels in that region. He occupied three years in a journey along the Arctic shores of *Siberia* and the *New Siberian Islands*, and is, indeed, the chief explorer of this group. He says, that to the north of these Islands the Polar Sea is open and free from ice. *It never freezes*, and even in March little drift ice is seen; and he expresses his belief that from these Islands, the opposite northern extremities of America and Greenland, as well as the North Pole itself, would be reached far more easily than from any other direction. There are also two excellent harbours in the *Island of Kotelnoi*, one of the group.

This evidence of one who must be regarded as our highest authority respecting the sea to the north of the *New Siberian Islands*, becomes much more important, when compared and combined with other facts. It will be recollected that Lieutenant Anjou, in his memorable ice journeys to the

north of the same Islands during three consecutive years, was invariably arrested, at a very short distance from the land, by the open sea; he arrived at the conviction that all efforts to advance by the ice to any considerable distance from land, must prove unavailing, and offered to attempt the same object with a boat, to which, however, the Russian government refused their consent.

Respecting the state of the Polar Sea nearly due west from these Islands, namely, to the north of *Cape Taimura*, the northernmost cape of Asia, we have the very high testimony of Professor Middendorf, who states his belief that this cape, which he failed to reach by land, may be reached by sea. From the northernmost point which he attained, he described that *Cape*, and saw to the north of it an open sea without a particle of ice, and no iceblink in any direction. The unequivocal proof that the same part of the sea was in open communication with the Great *Polynia*, is the occurrence of fresh driftwood, consisting of larches, pines, and ash trees, which could only have come from the large Siberian Rivers. The tides, too (in *Taimyr Bay*), amounting to thirty-six feet, prove the connection of that bay with a large sea. Still further west we have the testimony of Barentz, Vlaming, the walrus-hunter Issakow, (who reached the north-eastern extremity of *Novaia Zemlia* in 1834,) and others, that there is an open sea to the north of that country.

To the north of *Spitzbergen*, we have the accounts of the numerous Dutch and other whalers that an open sea is frequently found there, and as pleasant to navigate as the 'sea of Amsterdam;' and here I may remark, that I see no ground for entirely rejecting the old accounts of the Dutch having attained a very high latitude in those seas, even to within 1° of the Pole. The observations in those days, I readily acknowledge, were not so accurate as those of our own, and the instruments were very defective; but the great care in observing, the honesty and earnestness of purpose of those Dutch navigators, partly made up for such defects. Admiral Lütke bears high testimony to, and expresses his astonishment at, the surprising accuracy of Barentz's observations, made as far back as 1596, with insufficient instruments, and under the most unfavourable circumstances. The Dutch, it must be allowed, were not only among the most able and intelligent, but also among the most hardy and enduring of all navigators at that period. Willoughby, with the whole of the crews of both his vessels, amounting to 65 souls, were frozen to death while wintering on the coasts of *Russian Lapland* (in lat. $68^{\circ} 15'$ north), in the year 1554; while Barentz, forty-three years later, passed a winter of nine months' duration on the north-eastern coast of *Novaia Zemlia* (lat. 76° north), and of his whole crew, amounting to seventeen, only two died there.

But even if the early Dutch voyages to the north of *Spitzbergen* be altogether rejected, we have the evidence of more recent navigators, especially that of Sir E. Parry, who, indeed, started in the hope of finding solid ice, upon which to reach the North Pole in sledge-boats; and what did he find? This will best be seen by extracts from his work. On the 10th June, 1827, (in lat. $80^{\circ} 36'$), 'there was at this time much clear water to the N. and N.N.E.' In lat. $80^{\circ} 43'$, 'appearance of much clear water.' In $80^{\circ} 49'$, or one mile to the north of Phipps' furthest, nothing like the heavy or main ice could be seen. The highest latitude obtained by the vessel was $81^{\circ} 5' 32''$. All that could here be seen to the north (14th June) was loose drift ice. It appears, indeed, the higher they went, the less of the main ice they met with. To the N.E. it was particularly open. Page 44: 'We were much disappointed in seeing no indication of the main ice...so that although we were now twenty-five miles to the north of the station in which Phipps remarked that the 'ice appeared flat and unbroken', as seen from a considerable height on shore, all that we could discover was quite of a contrary description.' Page 47:—Traces of reindeer were found on the *Seven Islands*; from here the sea to the north

was observed to be 'perfectly clear.' In the memorable boat voyage, the following observations occur: 'It is a remarkable fact that we had already (26th June) experienced, in the course of this summer, more rain than during the whole of seven previous summers taken together, though passed in latitudes from 7° to 15° lower than this.' In another place, p. 84: 'I had never before seen any rain in the Polar regions to be compared to this, which continued, without intermission, for twenty-one hours, sometimes falling with great violence and in large drops.' 16th July. A couple of small flies upon the ice; the general thickness of the floes of ice about *half of that to the west of Melville Island*. 17th July. Temperature 36° to 40°, one of the warmest and most pleasant days. At page 92 the weather is compared to an 'April day in England.' From the highest point they reached in the boats, 82° 40' 23" (at one time probably 45'), they could perceive nothing like land in any direction; found no bottom with 500 (!) fathoms of line,—and 'so small was the ice now around us, that we were obliged to halt for the night at 2 A.M., on the 25th, being upon the only piece in sight, in any direction, on which we could venture to trust the boats while we rested. Such was the ice in the latitude of 82½°!'^{*}

Such was the journey in search of a supposed solid body of ice, which had been conjectured to extend from *Spitzbergen* to the North Pole.

On the high authority of Sir E. Parry as to the immense amount of rain in that sea, as quoted in the above, it may reasonably be inferred that a much greater extent of *open water* is to be looked for in that quarter than in the region of his explorations of the seven preceding years in Arctic America, as such an amount of rain cannot come from either land or sea covered with ice and snow. It is important to observe that rain seemed to fall with all winds except W.S.W.; which is easily explained, as this wind came from the direction of *Greenland*.

The foregoing facts,—and many more could be added,—derived as they are from high authorities, all tend to prove the existence of a very large Polar Sea, more or less open, and which extends to the north of nearly a half circle from the *New Siberian Islands* to *Spitzbergen*. There is no other part of the *Arctic Basin* where so high an authenticated latitude as 82° 40' (probably 45') has been attained; and here the ice was only half the thickness of that at *Melville Island*. There is, indeed, as far as our actual knowledge goes, no other part of the *Arctic Basin* having anything like a sea so extensive and comparatively open as the one under consideration.

Captain Beatson, the projector of an expedition through *Behring's Straits*, objects to my proposed route, from the difficulty of passing *Cape Taimura*, the northernmost cape of Asia. It is true the attempts of the Russians to round this cape have all failed; but this was partly owing to their keeping close to the shore, and thus coming in collision with the ice, and partly to the insufficiency of their boats. *No one has ever tried to pass this cape in the high sea to the north*, and there is no ground whatever to suppose that this cape offers greater difficulties than the northern capes of *Spitzbergen*, which are about 3° nearer the Pole. Prominent capes like these, where the elements are turbulent, offer more or less difficulties in all zones. *Hakluyt's Headland*, the northwesternmost cape of *Spitzbergen*, is one of those difficult points, and has on that account been named '*Duyvels Hoek*' by the Dutch; but these difficulties are only experienced by vessels approaching too closely.

Some persons have attempted to ridicule my plan on account of the *dark season*. My proposition as to the best time of the year when a vessel should start, referred to February and March; and I stated distinctly, "vessels arriving in the Polar sea in February or March, just before or when the sun has made its appearance, might, if only once able to enter the Polar

^{*} For further particulars, see Appendix p. 23.

basin, easily traverse it to the opposite side before the power of the sun has set in motion the great icebearing current, and they would then have before them the whole summer in the fullest sunshine for carrying out the object of their voyage," &c. These persons must be ignorant of the fact, that the sun appears on the 80th parallel in February, and does not entirely disappear again till October: and they must also know little of the duration of twilight and the occurrence of the Aurora Borealis. The Norwegians, indeed, are out fishing in the Spitzbergen Sea till November, and commence in February, and their fishing probably extends to as high a latitude as my proposed route.

Others have asserted that the sea to the north of *Behring's Straits* was well known, and that the sea to the north of *Novaia Zemlia* and *Siberia* was quite the reverse. In the first place, I beg to differ from this assertion, inasmuch as I think the Russian navigators and explorers have not left us entirely ignorant of the latter region. Secondly, it is clear that to search for Sir John Franklin *effectually*, expeditions should not be limited to regions well known, but should also extend to those entirely unknown. And lastly, all we know of the sea to the north of *Behring's Straits*, and nearly as far as the *New Siberian Islands*, tends to show the existence of an extensive land, approaching the Asiatic continent sufficiently near to compress the sea into one of those narrow channels, which are well known to offer the greatest difficulties to Arctic navigation. Whereas, in the whole of the sea from *New Siberia* to *Spitzbergen*, everything tends to show the existence of a large Polar ocean, and the absence of land, in that region.

I am, in fine, greatly strengthened in my belief, since the publication of my first letter, that a steam vessel could easily, and within a few weeks, in the way and in the time I have proposed, reach the *New Siberian Islands*, which, according to Hedenström, our highest authority, form the most favourable starting-point, on the Asiatic side, for a voyage across the '*Polynia*' to the opposite northern extremities of America. On the other hand, it cannot be denied that eastwards of the *New Siberian Islands* to the north of the *Kolyma*, and as far as *Behring's Straits*, very little advance has been made in vessels since Cook, by either English or Russian navigators.

I have, etc.,

Augustus Petermann.

IV. FURTHER ADDITIONS.

(May 1852.)

I have lately become acquainted, through Lieut.-Col. Sabine, with a rare work, giving an account of "Captain Pagès' Voyages round the World, and towards the Two Poles".* This scientific navigator gives one of the most comprehensive and lucid accounts I have seen of the Polar Basin, particularly with respect to the possibility of reaching the North Pole; and it is gratifying for me to find that his views entirely coincide with mine. He says (vol. ii, pp. 192-93): "I was therefore of opinion, that the opening between Spitzbergen and *Novaia Zemlia* was the most practicable [for a voyage to the North Pole], on account of its width and the extent of its outlet; the experience made by the navigators I have alluded to, and the movement of the drift ice, proved to me that it would be necessary to keep far away from the land. I did not believe, however, that to the N.N.W. of *Novaia Zemlia* there was any sea entirely free from ice, but only one more or less so, which would be as easily navigable as the sea to the north-west of Spitzbergen."—(p. 195.) "A vessel destined for such an expedition, should sail

* Voyages autour du monde, et vers les deux Poles, pendant les Années 1767, 1768, 1769, 1770, 1771, 1773, 1774, et 1776, par M. de Pagès, Capitaine des Vaisseaux du Roi, etc., etc. Berne, 1783.

from the coasts of Germany towards the end of February, in order to arrive in the Polar Regions by the end of March. They would there wait till some passage opened. . . . The month of March or the beginning of April would not be too early. It would be advantageous to profit by this time of year, because the clearest weather is in the months of April, May, and June. The end of June, and July and August, are foggy and rainy."

Colonel Sabine's own opinion, as combined with that of Admiral Wrangell, is worthy of serious consideration. He says,* that in the Siberian Sea no difficulty at all like those in the "land-locked and ice-encumbered" regions on the American side is offered to navigation. And, according to Admiral Wrangell,† "it should be possible to reach and follow this open water [viz., the Siberian Sea] from Spitzbergen."

V. NOTES ON THE DISTRIBUTION OF ANIMALS AVAILABLE AS FOOD IN THE ARCTIC REGIONS.

(Read before the Royal Geographical Society of London, February 9, 1852.)

It has long been a common but erroneous supposition that animal life within the Arctic regions decreases as the Pole is approached. This opinion probably had its origin chiefly in the observation made respecting the distribution of mankind; for the number of our fellow-creatures living beyond the Arctic circle is very small, and, as far as we know, ceases altogether between the seventy-fifth and seventy-seventh parallels. The Polar regions permit, indeed, a precarious existence to man; but it is quite different as regards the animals, many of which are so thoroughly adapted to the intense cold and other features of the frigid zone, that they could not even exist in any other. Animal life is found as much in the Polar as in the tropical regions, and though the number of *species* is decidedly inferior, the immense multitudes of *individuals* compensate for this deficiency. Some years ago, I wrote with regard to this point:—'if we were to conclude from a large number of species, that there must be a large number of individuals, we should come to erroneous conclusions. The Arctic and tropical countries furnish an excellent example, at least in their Mammalian and Ornithological Faunas, that such is frequently not the case. We need only refer to the crowds of birds which hover over the islands and shores of the north, or to the inconceivable myriads of penguins met with by Ross on the Antarctic lands, where there was not even the smallest appearance of vegetation; and, among the quadrupeds, to the thousands of fur animals that are annually killed in the Arctic regions. Wrangell gives a fine description of animal life in the *Kolyma* district of *Siberia*, one of the coldest regions of the globe: the poverty of vegetation is strongly contrasted with the rich abundance of animals; countless herds of rein-deer, elks, black bears, foxes, sables, and grey squirrels, fill the upland forests; stone foxes and wolves roam over the low grounds. Enormous flights of swans, geese, and ducks arrive in spring, and seek deserts, where they may moult and build their nests in safety. Eagles, owls, and gulls pursue their prey along the sea coast; ptarmigans are seen in troops among the bushes, and little snipes are busy along the brooks and in the morasses. Baer, also, relates that a walrus hunter on the rocks of *Nova Zembla* caught in a few hours 30,000 lemmings. On the other hand, in Australia, and other regions of the tropical and temperate zones, a traveller will frequently journey for weeks together, and pass over hundreds of miles of country, without meeting with a single quadruped.'

* Wrangell's Narrative, English translation, 2nd edition, p. x.

† Ibid. p. vi.

‡ See "Atlas of Physical Geography", by Petermann and Milner, p. 130.

I will, in the first place, proceed to indicate the regions to which these remarks refer; those, namely, which comprise the Arctic fauna. On this point I have adopted narrower limits than other authors, inasmuch as I have taken the northern limit of woods as the southern boundary of the region under consideration. It is true that some Arctic animals are found to the south of this line, like the rein-deer,—still these are not exclusively Arctic in their character, and they are also, more or less, of migratory habits. The ice-fox, a beautiful little animal, well known to Arctic voyagers, and decidedly of Arctic character, does not extend to the south of the line assumed, which also coincides with the extreme northern limit of the reptiles, and corresponds pretty closely with the line of 50° mean summer temperature. The region thus comprises *Iceland*, *Spitzbergen*, *Novaia Zemlia*, the extreme northern shores of Europe and Asia, with the north-eastern extremity of the latter, including also the sea of *Kamtschatka* and the *Aleutian Islands*, but excluding the peninsula of *Kamtschatka*. On the American side it comprises a considerable portion of *British North America*, the northern part of *Labrador*, and the whole of *Greenland*.

Though several classes of the animal creation—as, for example, the reptiles—are entirely wanting in this region, those of the mammals, birds, and fishes, at least bear comparison, both as to number and size, with those of the tropics,—the lion, the elephant, the hippopotamus, and others, being not more notable in the latter respect than the polar bear, the musk ox, the walrus, and, above all, the whale. Besides these, there are the moose, the rein-deer, the wolf, the polar hare, the seal, and various smaller quadrupeds. The birds consist chiefly of an immense number of aquatic species. Of fishes, the salmon, salmon-trout, and herring are the principal, the latter especially occurring in such myriads as to surpass everything of the kind met with in tropical regions. Nearly all these animals furnish wholesome food for man. They are, with few exceptions, distributed over the entire region. The number of individuals is different in different parts. Thus, on the American side the animals increase in number from east to west,—on the shores of *Davis's Straits*, *Baffin Bay*, *Lancaster Sound*, *Regent Inlet*, fewer are met with than in *Boothia Felix* and the *Parry Group*. The abundance of animal life in *Melville Island* and *Victoria Channel* is probably not surpassed in any other part of the American side. Proceeding westward to the Russian possessions, we find considerable numbers of animals all round and within the sea of *Kamtschatka*, as also to the north of *Behring's Straits*. The yearly produce of the Russian Fur Company in America is immense, and formerly it was much greater. *Pribilow*, when discovering the small islands named after him, collected within two years 2,000 skins of sea otters, 40,000 sea bears (Ursine seals), 6,000 dark ice foxes, and 1,000 poods of walrus teeth. *Lütke*, in his voyage round the world, mentions, that in the year 1803, 800,000 skins of the Ursine seal alone were accumulated in *Unalaska*, one of the depôts of the Russian Fur Company; 700,000 of these skins were thrown into the sea, partly because they were badly prepared, and partly in order to keep up the prices. But in no other part of the Arctic region is animal life so abundant as in north-eastern Siberia, especially between the rivers *Kolyma* and *Lena*. A description of the *Kolyma* district has already been given, to which the following particulars may be added. The first animals that make their appearance after the dreary winter, are large flights of swans, geese, ducks, and snipes; these are killed by old and young; fish also begin to be taken in nets and baskets placed under the ice. In June, however, when the rivers open, the fish pour in in immense numbers. At the beginning of the present century, several thousand geese were sometimes killed in one day at the mouth of the *Kolyma*; about twenty years later, when Admiral *Wrangell* visited those regions, the numbers had somewhat decreased, and it was then called a good season when 1,000 geese, 5,000 ducks, and 200 swans were killed at that place. Reindeer hunting

forms the next occupation of the inhabitants. About the same time the shoals of herrings begin to ascend the rivers, and the multitudes of these fish are often such, that in three or four days 40,000 may be taken with a single net. On the banks of the river *Indigirka* the number of swans and geese, resorting there in the moulting season, is said to be much greater even than on the *Kolyma*. West of the *Lena*, and along the whole of the remainder of the *Siberian* shores as far as *Nova Zembla*, and including that island, animal life presents a great contrast to the preceding portion, as it is nowhere found in such abundance as in the districts already described, and in many parts it is extremely scarce. *Spitzbergen* completes our very general circumpolar survey. There, though plenty of animals are found, among which are very acceptable fat rein-deer, still the number generally is much inferior to that of north-eastern *Siberia*. It will naturally be asked, whence arises this great difference in the distribution, or rather, the relative intensity of animals within the Arctic region? The reply is furnished by the climate, and particularly by the distribution of temperature. On comparing the zoological and also the botanical features with the observations of temperature made within the Arctic regions, I find that the summer temperature is of the utmost consequence to the existence and development of both animal and vegetable life, and that, without exception, where it is the highest, animals are found most plentiful, and the reverse where the temperature is the lowest. Thus, of all the shores of the Arctic basin, those of north-eastern *Siberia* possess the greatest abundance of animal life, because there the temperature is comparatively the highest in summer, although in winter the same region is the coldest on the face of the globe.

Without going further into detail, I will merely add a few words as to the bearings of the foregoing observations on Sir John Franklin's Expedition.

The general opinion is that the missing vessels have been arrested somewhere between *Wellington Channel* and *Behring's Straits*, and the *Siberian* shores. Most probably their position is nearer to the latter than to the former points. As these three regions abound in animal life, we may fairly conclude that the intervening portion partakes of the same character, and moreover, that the further Sir John Franklin may have got away from *Wellington Channel*, and the nearer he may have approached the north-eastern portion of Asia, the more he will have found the animals to increase in number. The direction of the isothermal lines strongly corroborates this assumption, as they are indicative of a higher summer temperature in that region than in any other within the Polar basin. And as those countries are perhaps entirely uninhabited by man, the animals there would have continued in their primeval or original numbers, unthinned by the wholesale massacres in which myriads are destroyed for the sake of their skins or teeth.

An interesting fact was mentioned in this Society by Lieut. Osborn, namely, that Captain Penny in September 1850, had seen enormous numbers of whales running southwards from under the ice in *Wellington Channel*. We know this to be also the case in the *Spitzbergen* Sea every spring, and that these animals are numerous along the *Siberian* coasts. This not only proves the existence of one, or perhaps two, Polar Seas, more or less open throughout the year, but also that these seas abound in animal life,—to satisfy enormous numbers of whales an amount of food is required which cannot be small. And it is well known among the *Tchuktchi*, on the north-eastern coasts of *Siberia*,—where land to the north is said to exist in contiguity and probably connected with the lands discovered by Capt. Kellett,—that herds of rein-deer migrate between those lands and the continents.

Taking all these facts into consideration, the conclusion seems to be a reasonable one, that Franklin, ever since he entered *Wellington Channel*, has found himself in that portion of the Arctic regions where animals probably exist in greater plenty than in any other. Under these circumstances alone

his party* could exist as well as other inhabitants of the Polar regions, but we must not forget, that in addition to the natural resources, they would in their vessels possess more comfortable and substantial houses than any native inhabitants of the same regions.

NOTE.—The preceding remarks were hastily put together, for the purpose of being read before the Royal Geographical Society. The object of the author was not to give a long list of the animals killed or seen by the various expeditions, as has frequently been done before, but rather to demonstrate the causes of the very unequal distribution of animal life in the Arctic Regions generally. When the shores and waters of Wellington Channel were found to be “teeming with animal life”, it was regarded as a wonderful fact, that more animals should be found in that part than in those to the south of it. But as the summer temperature in the region towards Melville Island is higher than in the latter,—and as the development of vegetable and animal life chiefly depends on the warmth of two or three, or even one summer month,—there is nothing wonderful or extraordinary about it. The mean temperature, in July, of Melville Island, and probably of the region east to Wellington Channel, is higher than that of Winter Island, Port Bowen, Igloodik, Boothia Felix, and even Godhaab, on the west coast of Greenland, in lat. 64° (corresponding with that of Drontheim in Norway), as will be seen in the following list:—

Melville Island		42°.5
Godhaab		41°.9
Boothia Felix		41°.3
Igloodik		39°.1
Port Bowen		36°.6
Winter Island		35°.4

Taking the mean of the three summer months, June, July, August, the stations east of Regent Inlet and Boothia Gulf are, as in July, the coldest:—

Melville Island		37°.1
Igloodik		35°.0
Port Bowen		34°.4
Winter Island		31°.8

In comparing these data with the observations made on the Asiatic and European sides of the Arctic Regions, it will be seen that Winter Island is the coldest of all. This place is consequently the pole of cold of the Northern Hemisphere during the summer; and Mr. B. Seemann, the naturalist of H.M.S. Herald, informs me that it is likewise the phytological North Pole, namely, that point which possesses the smallest number of genera and species of plants, and whence the number increases in every direction.

A line, therefore, drawn from Winter Island to Lancaster Sound, shows the line of lowest summer temperature; and vessels having crossed this line, and reached Melville Island or Wellington Channel, may be said to have passed—not the mathematical—but certainly the natural or Physical North Pole. Actual experience is so far corroborative of this Physical fact, that no other part of the Arctic Regions has offered greater difficulties to navigation, than the one here designated as the Physical North Pole.

It has been a too common error, in matters regarding the natural features of the Arctic Regions, to take into consideration the lines of latitude only, and to disregard the lines of temperature altogether; the equator and the poles are too frequently considered the centres of the greatest heat and the greatest cold. In no other regions are the inferences drawn from such views more mischievous than in the Arctic Regions, where the temperature corresponds less with latitude than in any other part of the globe, and where

* See the means of sustenance found by the first navigators who were forced to winter in the Arctic Regions, Appendix p. 21.

(as I have elsewhere shown*) the temperature chiefly depends on the currents and the drift ice, the influence of which is remarkable.† The lines of temperature, in fact, become our lines of latitude in the Arctic Regions, so far as physical geography is concerned.

A too confined view has also been taken, in speaking of the Arctic Regions generally, by passing over the whole of the Asiatic half; but one of the most interesting features of those regions, is the existence of a large sea along the Asiatic continent, more or less open and free from ice during the whole of the year, and which is commonly called "Polynia" by the Russians. This sea is of paramount importance in the economy of the Arctic Regions.

The consideration of isolated facts alone can lead to no correct result; and it is only when the various natural features are compared and considered in their relative bearing, that the laws which govern nature can be traced and discovered. It is in this manner only that physical geography becomes a really useful and practical science. And, though the preceding notes are but a very general and hasty sketch of the distribution of animals in the Arctic Regions, it is for the first time that anything like a comprehensive outline has been offered.

My authorities have been the works of the various expeditions by the English, Russian, and other nations; the zoological accounts of Richardson, Baer, Wrangell, and others, particularly the important papers on the distribution of mammals by Dr. Wagner. The meteorological data are derived from Dove's tables.

APPENDIX.

The following are extracts from Barentz's Third Voyage to effect a North-Eastern Passage—the English translation by William Phillip, published London, 1609.‡ Barentz's voyages are among the most important and remarkable ever undertaken in northern latitudes; and, while the narrative of these voyages is intensely interesting and curious, its faithfulness has not only never been called in question, but the general correctness of the various observations and facts recorded by the Hollanders have recently been fully confirmed by Admiral Lütke's surveying expeditions in the years 1821 to 1824.

In a geographical point of view, Barentz's last voyage is of the highest importance. It was in this voyage that the Hollanders were obliged to winter at the north-eastern extremity of Novaia Zemlia for ten months, and this is (if I mistake not) the only instance of a party wintering in a Polar country, facing to the north, surrounded and exposed to the influence of the Polar Ocean,—and keeping a careful journal. This voyage, consequently, although dating nearly three hundred years back, constitutes our only source of information respecting the temperature, winds, ice, occurrence of animals, and other natural features, during the winter in a Polar region, surrounded by the great Polar Ocean.

* See page 7.

† See Dr. Sutherland's forthcoming work "Account of a Voyage in Search of Sir John Franklin commanded by Captain Penny."

‡ This valuable work will shortly be published by the Hakluyt Society, with a resumé of all the voyages undertaken in that region, and other matters very little known.

1. Extract from Willem Barents's Third Voyage,

Showing the state of the Polar Sea to the north of *Novaya Zemlia* during the Arctic winter months, September 1596 to March 1597; with notices respecting the amount of daylight.

25 September.—The ice begā somewhat to open....If we had layne in the maine sea, we would have hoysed sayle, although it was thē late in the yeare.

26 September.—We had a west wind and an open sea.

28 September.—It was faire weather, and the sun shon, the wind being west and very calme, the sea as then being open.

5 October.—It blew hard north-west, and the sea was very open and without ice, as farre as we could discover, but we lay still frozen as we did before, and our ships lay two or three foote deepe in the ice.

10 October.—The water flowed two foote higher than ordinary, which wee gest to proceede from the first north wind, which as then had blowne.*

20 October.—It was calme sunshine weather, and then againe we saw the sea open.

26 October.—The wind was north, and north-north-west, with indifferent faire wether: then we saw open water hard by the land.

(From the 4th November the sun was below the horizon.)

5 November.—The wind was north, and somewhat west, and then we saw open water upon the sea, but our ships lay still fast in the ice, and when the sunne had left vs, we saw y^e moone continually both day and night, and neuer went downe when it was in the highest degree.

8 November.—Saw open water in the sea.

3 December.—We had the like [foule] weather, at which time, as we lay in our cabans, we might heare the ice crack in the sea, and yet it was at the least half a mile† from us, which made a hugh noyse, and we were of oppinion, that as then the great hills of ice which we had seene in the sea, in summer time, brake one from the other.

24 December.—Being Christmas Even, it was faire wether, then we opened our doore againe, and saw much open water in the sea: for we had heard the sea crack and drive: although it was not day, yet we could see so farre.

13 January, 1597.—It was faire still weather, the wind westerlie, and then we perceaved that day-light began more and more to increase, and wee went out and cast bullets at the bale of y^e flag staffe, which before we could not see when it turn'd about.

(22 January.—Day light began to appear.)

(24 January.—First saw the edge of the sun again.)

22 February.—We made ready a slead to fetch more wood...saw much open water in the sea.

5 March.—We saw much open water in the sea, more than before, which put vs in good comfort, that in the end we should get away from thence.

6 March.—Some of us climbed out of the chimney, and perceaved that in the sea, and about the land, there was much open water.

7 March.—Saw more open water in the sea, and about the land, whereby we were in doubt that the ship in that foule weather and driuing of the sea, would be loose while we were shut up in our house, and we should have no meanes to helpe it.

8 March.—It was still foule wether with a south-west storme, and great store of snow, whereby we could see no ice in the north-east, nor round about in the sea, whereby we were of opinion that north-east from vs there was a great sea.

* This proves a large extent of sea to the north.—P.

† Equal to two English miles.

9 March.—We could see farther from vs, and perceive that the water was open in the north-east, but not from vs towards Tartaria, for there we could still see ice in the Tartarian Sea, otherwise called the Ice Sea, so that we were of opinion, that there it was not very wide, for when it was cleere weather, we thought many times that we saw the land, and showed it unto our companions, south and south-east from our house, like a hilly land.

10 March.—It was cleere weather, the wind north,...at which time we saw an open sea, whereupon we said vnto each other, that if the ship were loose, we might venture to saile awaie.

(During all the time to which the preceding notes refer, the Hollanders were mostly shut up in their hut; and it would appear that on almost all occasions when they ventured out, either to visit their vessels, fetch drift-wood, or catch foxes, or even at their look-out from the chimney, a more or less open sea was perceived, and this, too, during the dark season. With April, that is, the beginning of the Arctic summer, there was a notable change. It was then that the ice began to drive in again from the east and north-east. Under date of the 15th April, the Journal says: "We went along by the sea side, and there we saw that in the end of March and the beginning of Aprill the ice was in such wonderfull maner risen and piled vp one vpon the other, that it was wonderfull in such manner as if there had bin whole townes made of ice, with towers and bulwarkes round about them." On the 4th May they found the open water at 500 paces from the ship, and the same enclosed with high hills of ice, whereas in the middle of March the open water was only 75 paces distant. They waited and waited, week after week, hoping that with the advance of the season the ice would again drive away, so as to make their ship loose and put to sea in it; but in vain. At last, in the beginning of June, feeling convinced of the hopelessness of the case, they determined to abandon their ship, and prepare their boats to return in them. This remarkable voyage in their two open frail boats as far as Lapland, is unparalleled in the Annals of Arctic navigation.)

2. Extracts from Willem Barentz's Third Voyage,

Showing the means of sustenance found by that expedition while wintering at the north-eastern extremity of Novaia Zemlia, 11 September, 1596, to 13 June, 1597; with incidents respecting the killing of animals.

11 September.—Determined to build a house vpon the land, to keep vs therein as well as we could. . . . Found certaine trees, roots, and all which had been driven vpon the shoare. . . . That wood served vs not onely to build our house, but also to burne and serve vs all the winter long.

14 September.—Went into the land, and laid the wood in heaps one vpo the other, that it might not be covered over with y^e snow.

15 September.—In the morning, as one of our men held watche, wee saw three beares, whereof the one lay still behind a peece of ice, the other two came close to the ship: which wee perceiving, made our peeces ready to shoote at them, at which time there stod a tub full of beefe, vpon the ice, which lay in the water to be seasoned, for that close by the ship there was no water: one of the beares went vnto it, and put in his head to take out a peece of the beefe, but she fared therewith as the dog did with y^e pudding, for as she was snatching at the beefe, she was shot into the head, wherewith she fell down dead, and never stir'd: the other beare stood still, and lolt upon her fellow, and when she had stood a good while she smelt her fellow, and perceiving that she was dead, she ran away, but we tooke halberds and other armes with vs and followed her, and at last she came againe towards vs, and we prepared ourselves to withstand her, wherewith she rose vp vpon

her hinder feet, striking to rampe at vs, but while she reared herselfe vp, one of our men shot her into the belly, and with that she fell vpon her fore-feet againe, and roaring as loud as she could, ran away. Then we tooke the dead beare, and ript her belly open; and taking out her guts, we set her vpon her fore feet, that so she might freese as she stood, intending to carry her wt vs into Holland.

(On the 12th October they began to live in the house they had built.)

27 October.—That day our men kil'd a white fox,* which they flead: and after they had roasted it, ate thereof, which tasted like connies flesh. The same day . . . we hung up a lamp to burne in the night time, wherein we used the fat of the beare.

2 November.—One of our men killed a fox with a hatchet, which was flead, roasted, and eaten: before the sunne began to decline, wee saw no foxes, and then the beares vsed to go from vs.

(From the 4th November the sun was below the horizon.)

4 November.—Tooke a white fox.

8 November.—Tooke a white fox.

11 November.—We made a round thing of cable yarn, and like to a net, to catch foxes withall, that we might get them into the house, and it was made like a trap, which fell vpon the foxes as they came vnder it, and that day we caught one.

23 November.—As we perceived that the fox vsed to come oftener, and more than they were woont, to take them the better, we made certaine traps of thicke plancks, whereon we laid stones, and round about them placed peeces of shards fast in the ground, that they might not dig under them, and so got some of the foxes.

24 November.—Tooke foure foxes.

25 " Tooke two foxes.

27 " We made more springes to get foxes, for it stood vs vpon to doe it, because they served vs for meat, as if God had sent them purposely for vs, for we had not much meate.

29 November.—We found al our traps and springes cleane covered over with snow, which we made cleane, and set them vp again to take foxes: and that day we tooke one, which as then served vs not onely for meat, but of the skins we made caps to were vpon our heads.

30 November.—It was faire cleare weather, the wind west, and sixe of vs went to the ship, all wel provided of arms to see how it lay: and when we went vnder the fore decke, we tooke a foxe alive in the ship.

9 December.—Made our springes ready to take foxes.

10 December.—Tooke two foxes, which were good meate for vs, for as then our victuals began to be scant, and the cold still increased, wherunto their skins serued vs for a good defence.

13 December.—Tooke another fox.

15 December.—Tooke two foxes.

18 December.—Some of vs went out vnto the ship: . . . in the cabin . . . we found a fox, which we tooke.

20 December.—Tooke a fox.

21 December.—Cleansed our traps for the foxes, which did us great pleasure when we tooke them, for they seemed as dainty as uenison vnto vs.

25 December.—Being Christmas day, it was foule wether, with a north-west wind; and yet, though it was foule wether, we hard the foxes run ouer our house, wherewith some of our men said it was an ill signe; and while we sate disputing why it should be an ill signe, some of our men made answere, that it was an ill signe because we could not take them, to put them into the pot to rost them, for that had beene a very good signe for vs.

* Before the foxes made their appearance they had encountered numerous bears, some of which they killed, but did not use their flesh.—P.

29 December.—Made cleane our springes for the foxes, whereof for certaine daies we had not taken any; and as we made them cleane, one of our men found a dead fox in one of them.

(The cheerfulness and spirit of the Hollanders in their winter quarters will be seen from the following extract.)

5 January, 1597.—We remembred ourselues that it was Twelf Even, and then we prayed our Maister that we might be merry that night, and said that we were content to spend some of the wine that night which we had spared, and which was our share euery second day, whereof for certaine daies we had not drunke; and so that night we made merry, and drunke to the three kings, and therewith we had two pound of meale, whereof we made pancakes with oyle, and every man a white bisket, which we sopt in wine: and so supposing that we were in our owne country, and amongst our frends, it comforted vs as well as if we had made a great banket in our owne house: and we also made tickets, and our gunner was king of Nova Zembla, which is least two hundred miles long, and lyeth betweene two seas.

6 January.—We went out and clesed our traps to take foxes, which were our uenison.

8 January.—It was faire weather againe; the wind north; then we made our springes ready to get more uenison, which we longed for, and then we might see and marck day-light, which then began to increase.

21 January.—It was faire weather, with a west wind: at that time taking of foxes began to faile vs, which was a signe that the beares would soone come againe, as not long after we found it to be true; for as long as the beares stay away, the foxes came abroad, and not much before the beares came abroad, the foxes were but little seen.

(24 January.—First saw the edge of the sun again.)

12 February.—[Killed a bear] flead her, and tooke at least one hundred pound of fat out of her beli, which we molt, and burnt in our lampe. This grease did us great good seruice, for by that meanes we stil kept a lampe burning all night long, which before we could not doe for want of grease, and every man had meanes to burne a lamp in his caban....The beares skin was 9 foote long, and 7 foote broad.

23 February.—Tooke two foxes, that were as good to vs as venison.

(From this date to the time of their departure no mention is made of what they took, their minds being wholly engrossed with plans and preparations for their return. It is clearly seen, however, from these extracts, that in the worst season of the year they caught almost daily, before their door, and with very little trouble, plenty of animals, the meat of which they relished "as venison." And this, in a country which is notoriously one of the poorest as regards animal life, within the Arctic regions.)*

3. Additional Observations respecting the Ice, Climate, and Natural Resources in the Regions on the Northern Side of Spitzbergen, from 80° Northwards, by Sir E. Parry.

(Extracted from his "Narrative", 1827.)

The following notes begin with the 4th August, 1827, after they had commenced returning with their boats to the south.

Lat. 82° (p. 111). "It was almost calm, and, to our feelings, oppressively warm during the day, the thermometer within the boats rising as high as 66°, which put our cut dresses nearly out of commission."

* See page 17.

11 August, in lat. $81^{\circ} 34'$ (p. 118) "the sea was crowded with shrimps and other sea-insects, on which numerous birds were feeding."—On Walden Island, lat. $80^{\circ} 35'$ (p. 122), "a great number of female eider-ducks, with their flocks of young, were swimming about the island; and the *tripe de roche* and *cochlearia* were here more luxuriant than we had ever seen them. Drift-wood was, as usual, in great abundance in every spot where it could effect a landing. No ice was in sight, to the utmost limit of a very extensive view."—After having reached the main island of Spitzbergen, about lat. 80° , 19 August (p. 123), "...Low island strewn in every part with immense quantities of drift-wood."—(P. 127.) "As the wind now blew so much upon the shore, I was in momentary expectation of seeing some ice come in; but we were agreeably surprized to find that none appeared. This circumstance appeared to us the more remarkable, from the extraordinary rapidity with which, in the month of June, the very lightest air from the westward brought the drift-ice in upon the land, rendering these shores quite inaccessible in the course of a few hours."

P. 129. "In this [viz., the Appendix] there is nothing so remarkable as the extraordinary quantity of rain, of which it may be safely said, that *twenty times* as much fell in the course of this one summer as during any preceding one we had passed in the polar regions, even in latitudes from 8° to 16° lower."* P. 133. "The shores of the Strait, like all the rest in Spitzbergen, are lined with immense quantities of drift-wood, wherever the coast will allow it to land."—(P. 134.) "The animals met with here [in Hecla Cove], during the Hecla's stay, were principally reindeer, bears, foxes, kittiwakes, glaucous, and ivory gulls, tern, eider-ducks, and a few grouse. Loons and rotges were numerous in the offing. Seventy reindeer were killed, chiefly very small, and, until the middle of August, not in good condition. They were usually met with in herds of from six or eight to twenty, and were most abundant on the west and north sides of the bay. Three bears were killed. The vegetation was tolerably abundant."—(P. 137.) "The officers who remained on board the Hecla (lat. 80°) during the summer, described the weather as the most beautiful, and the climate altogether the most agreeable they had ever experienced in the polar regions. Indeed, the *Meteorological Journal* shows a temperature both of the air and of the sea water to which we had before been altogether strangers within the Arctic circle, and which goes far towards showing that the climate of Spitzbergen is a remarkably temperate one for its latitude. Mr. Crowe, of Hammerfest, who lately passed a winter on the south-western coast of Spitzbergen, in about latitude 78° , informed me that he had *rained at Christmas*;† a phenomenon which would indeed have astonished us at any of our former wintering stations in a much lower latitude. Perhaps, the circumstance of the reindeer wintering at Spitzbergen may also be considered a proof of a comparatively temperate climate."

* Sir Edward Parry, probably, has greater experience, and spent a longer time in the Arctic Regions, than any other Arctic navigator living; and this conclusion, therefore, must be regarded as firmly established as it is important. The same may be said of his opinion on the climate, in the subsequent lines.

† A fact which entirely agrees with those given by Keilhau, p. 7.

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planation.

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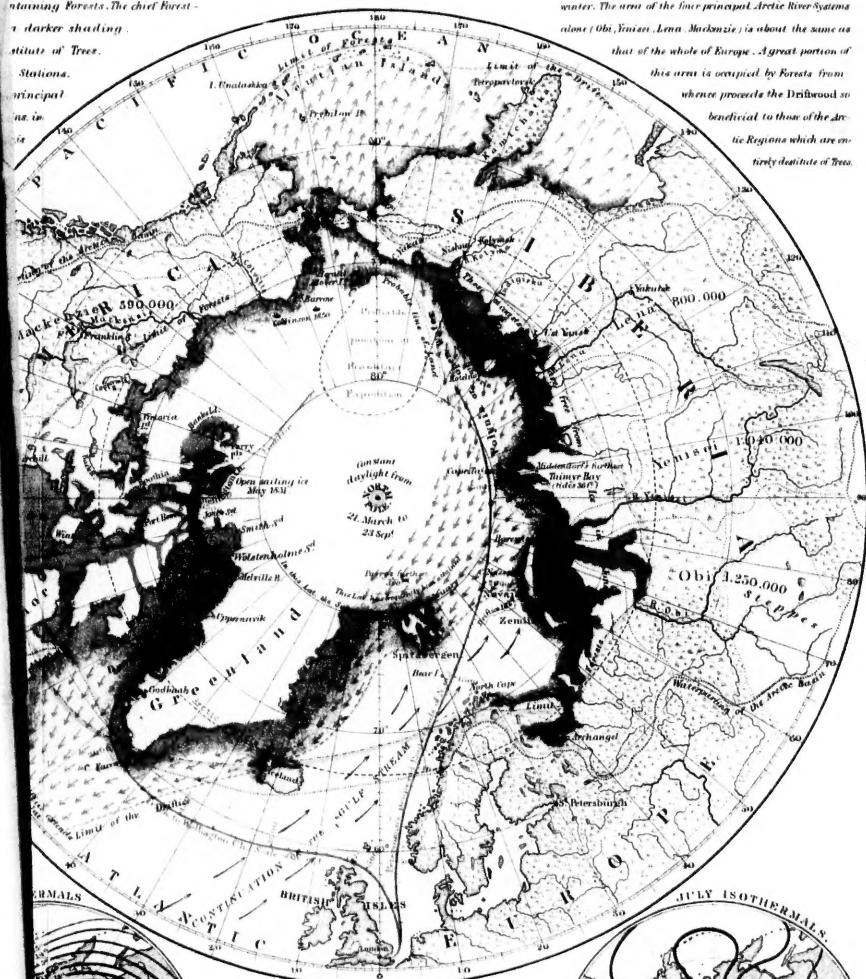
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Polar Chart to illustrate A. PETERMANN'S PAPERS ON THE ARCTIC REGIONS.

The Arctic Basin.

The term Arctic Basin is generally applied to the Arctic Ocean only, but it is of some importance to a correct and comprehensive understanding of its Natural or Physical features, to include within it those Countries which are drained off by that Ocean. The mighty Rivers, — of the Asiatic side particularly, are one of the prime-movers of the Polar Currents, breaking up the ice formed during the winter. The arms of the four principal Arctic River-Systems (Obi, Yenisei, Lena, Mackenzie) is about the same as that of the whole of Europe. A great portion of this area is occupied by Forests from whence proceeds the Driftwood so beneficial to those of the Arctic Regions which are entirely destitute of Trees.



ISOTHERMAL LINES of the coldest and hottest months of the Year.

In matters regarding the Physical Geography of the Arctic Region the consideration of the Distribution of Temperature is of paramount importance, next will be found that the distribution of Animal and Vegetable Life, the extent of Ice &c. depend much more on the direction of the Isothermal lines than on that of the lines of latitude.

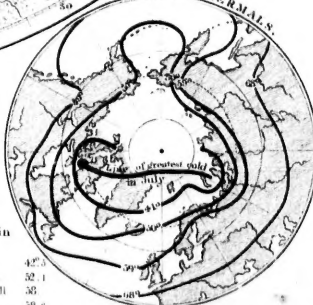
Comparative view of the mean Temperature in

JANUARY.

Yakutsk	— 43.5	St. Churchill	— 25.0	Winter 1.	— 25.0
Ust Yensk	— 39.5	Winter 1.	— 23.2	Sputzberg Svalbard	35.9
Nasutun Kolymok	— 31.3	F. Franklin	— 22.3	Noronia Zemlin	36.3
Melville 1.	— 31.3	Iglolik	— 26.1	Hart Bowen	36.6
Port Bowen	— 29.9	Noronia Zemlin	— 2.0	Noronia Zemlin	37.7
Boothia Felix	— 29.7	D. 2	— 6	Iglolik	39.1
		Godthaab	12.8	Boothia Felix	41.3

JULY.

Melville 1.	47.2
F. Franklin	32.1
St. Churchill	30
Ust Yensk	36.6
Nasutun Kolymok	37.7
Yakutsk	68.6



London: J. Cundell Street, 1871.

Explan

The dark green colour shows

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The green arrows denote the

of the Drifts in spring

The blue colour shows the

Sea in winter.

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Countries containing

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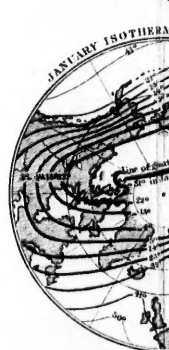
Metorological Station

The area of the principal

Arctic River Basins in

English Sq miles is

inscribed in each.



Explanation.

The dark green colour shows the extent of ice formed during every winter along the Arctic shore.

The green arrows denote the direction and extent of the Drifts in Spring and Summer.

The blue colour shows the probable extent of open Sea in winter.

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 Countries containing Forests. The chief Forest-regions have a darker shading.

 Countries destitute of Trees.

 Meteorological Stations.

The area of the principal

Arctic River Basins in

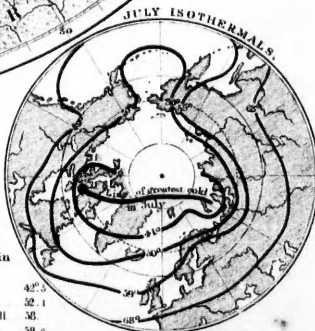
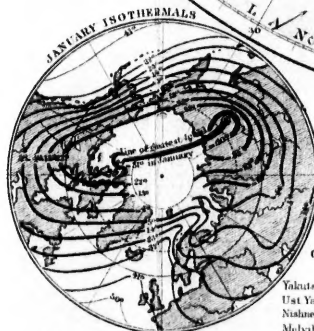
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Ust Yansk	-39.8	Winter I.	-25.2	Spiridonoff	33.9	P ^l Franklin	32.1
Nislanes Kolymak	-31.3	P ^l Franklin	-22.3	Nomis Zemlin	36.3	P ^l Churchill	30.0
Melville I.	-31.3	Iglolik	-16.1	Port Bowen	36.6	Ust Yansk	38.6
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